

Final Project Report to the NYS IPM Program, Agricultural IPM 2000 – 2001

Title:

Demonstrate to growers and consultants how to effectively use *Trichogramma ostriniae* to biologically control European corn borer in fresh market sweet corn.

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Type of grant: Systems comparison trials

Project location(s):

Niagara County, Coulter Farms and Freatman Farms in Lockport, NY
Erie County, W.D. Henry and Sons Farms and Henry Agle and Sons Farms in Eden, NY
Orleans County, Partyka Farms in Kendall, NY
Monroe County, Werner Farms in Rush, NY

Abstract:

Recent research has identified the use of *Trichogramma ostriniae* as a biological control for European corn borer (ECB). However, this technique has not been widely tested in commercial field situations. Adoption of this control method will have a better chance of wide scale acceptance if commercial sweet corn growers can experience the advantages of this practice first hand. *Trichogramma* wasps were released in four fresh market sweet corn fields in Western, NY and how well they controlled ECB was compared to three fields where traditional insecticides were used for control. In each of the wasp released fields *Trichogramma* had an effect on ECB infestation however insecticides had to be used in three fields because ECB had already become established in the field before the wasps were released. Only one of the wasp treated fields was sprayed three times to help control the level of ECB in the field. In all cases except one the amount of marketable ears harvested from the wasp treated fields was equal or higher than the chemical control treated fields. During years when ECB pressure is low *Trichogramma* releases have the potential to be a more economical and environmental way to produce fresh market sweet corn. The use of *Trichogramma* as a biological control of ECB on plastic fresh market sweet corn and early bare-ground sweet corn needs to be further field tested during years when ECB pressure is high and wasps are released into the field when the corn is younger than 2 weeks before tassel emergence.

Background and justification:

Data generated by Mike Hoffmann's lab demonstrates that inoculative releases of *Trichogramma ostriniae* in sweet corn can reduce the amount of damage to ears caused by European corn borer by half in unsprayed fields. Hoffmann's lab has also generated a table that allows a scout to take the ECB population reduction caused by *Trichogramma* into account when deciding if a field is over threshold using the number of parasitized egg masses found during scouting. The potential reduction in damage resulting from *Trichogramma* releases coupled with the ability to adjust the threshold has great potential to reduce insecticide applications in early season sweet corn without risk of unacceptable damage at harvest.

Objectives:

1. Demonstrate to growers and consultants the use of *Trichogramma* inoculative releases and thresholds adjusted by observed percent parasitism in fresh market sweet corn.
2. Determine whether the combination of inoculative releases and threshold adjustment results in a reduction in insecticide applications.
3. Determine whether the use of inoculative releases and threshold adjustments results in commercially acceptable quality at harvest.

Procedures:

This project was conducted by releasing 15,000 *Trichogramma ostriniae* wasps in two locations per acre at four sweet corn fields in Western NY. Wasps were released on the Coulter Farm in Lockport, the Henry Farm in Eden, the Partyka Farm in Kendall and the Werner Farm in Rush. Three other farms in Western NY were also scouted to get an indication of pest level in the area and chemicals used to control the insect pests that were present. The chemical control farms were the Freatman Farm in Lockport, the Agle Farm in Eden and another field on the Partyka Farm in Kendall.

Wasps were released one to two weeks before tassel emergence, which was when the plants were about knee-high. In Lockport, the Coulter Farm site ('Lancelot' an 80 day corn variety) and the Freatman Farm site ('Mystique' a 75 day corn variety) are comparable and weekly scouting for ECB and other pests began on July 2. In Eden, the Henry Farm site (PS 7404 a 78 day corn variety) and the Agle Farm site ('Serendipity' an 82 day corn variety) are comparable and weekly scouting began on July 17. In Kendall, the two Partyka farm sites ('Seneca Spring' a 64 day corn variety) are somewhat comparable. Weekly scouting in the wasp field began on June 23 and on July 22 in the chemical control field. In Rush, the Werner Farm site ('Geronimo' a 65 day corn variety) did not have a comparable nearby chemical control site. Weekly scouting in the wasp field began on July 8.

When scouting for ECB and the damage it causes, parasitized and unparasitized egg masses were recorded. To take parasitism into account, ECB thresholds were adjusted using the chart that Mike Hoffmann's lab has developed. If insect levels were over threshold it was the grower's choice whether or not to apply a chemical control measure.

Quality of the sweet corn ears from the seven different sites were evaluated by harvesting 100 ears (5 reps of 20 ears per field) and recording the number damaged or infested by ECB and CLA. Information on the economics of using wasps to control ECB was gathered by comparing the amount of sprays used in the wasp and chemical control fields in Lockport, Eden and Kendall. The Environmental Impact Quotient (EIQ) of the wasp and chemical controlled fields was used to compare the environmental impact of the two different control strategies.

Results and discussion:

Comparison of the Coulter wasp release field and the Freatman chemical control field revealed that at every scouting date (Figure 1) except July 2 the Coulter field had a lower percentage of damage from and/or worms or eggs of ECB than the Freatman field. Parasitized black ECB egg masses were found in the Coulter field on July 2 and this produced a higher adjusted economic threshold. The decision was made to not spray and to give the wasps a chance to reduce the population. July 2 was the only date at the Coulter field when parasitized ECB eggs were found. On each date at the Coulter field the 5% ECB economic threshold for silking corn was exceeded. However, the Coulter field was only sprayed once with SpinTor on July 12 to try and reduce ECB damage. In comparison, the Freatman field was sprayed with Warrior on July 9, Asana on July 19 and Warrior on July 25. The pheromone trap catch data for Lockport was low for the four scouting dates (Figure 2) indicating moth levels were probably higher on these two farms. CLA was just starting to become a problem at the last scouting date, 15% of the ears at the Freatman field were infested with CLA and 40% at the Coulter field. Ear quality in terms of marketable ears was similar at the two farms (Table 2) but they differed in the amount of ears damaged by ECB and CLA. The Freatman field had a higher amount of ECB damaged ears and the Coulter field had more CLA damaged ears.

At the Partyka Farm sites the wasp field was two weeks ahead of the chemical control field. The high amount of ECB in the wasp release field on June 23 (Figure 3) is an indication that ECB was already established in that field before the wasps were released. Pheromone trap counts from Hamlin (Figure 4) indicate a fair amount of moths in the area on June 6 and June 27. For the first four scouting dates the wasp field was over or equal to the 5% threshold for silking corn. The large drop in percent ECB infestation or damage going from June 23 to June 30 could be partly due to the wasps getting established. SpinTor was sprayed on July 1, 9 and 17 to help reduce the ECB infestation. The spray on July 17 may not have been necessary because a ECB parasitized egg mass was found on July 15 and 22. The *Trichogramma* wasp in combination with the SpinTor sprays had an effect on ECB infestation in the wasp field as indicated by the low amounts of ECB worms or damage on July 22 and 29 (Figure 3) versus the higher amounts for the chemical control field on those dates (Figure 5). CLA stayed at low levels for the wasp release field but was the major pest problem for the chemical control field. At all three scouting dates aphid pressure was very high and ECB infestation or damage was at or above the 5% economic threshold. The chemical control field was sprayed with Lannate on July 25 and 31 and Aug. 8. The chemical control field had more insect damaged ears and less marketable ears than the wasp release field because of the higher CLA infestation in the chemical field (Table 2). The wasp released field had one ECB damaged ear in 20 and the chemical control field did not have any.

In Eden, the Henry wasp release field did not receive any insecticides and the Agle chemical control field was sprayed twice with Warrior and twice with Lannate. No ECB parasitized egg masses were found in the Henry field but the amount of ECB worms or damage was always below the 5% threshold (Figure 6). In contrast, the Agle field was above the 5% threshold on July 17 and 30. The Eden pheromone trap counts (Figure 7) indicate that ECB moths were in the area just not in large amounts. The Henry field had a high amount of lady bug predators and some green lacewings which were effectively controlling the CLA until July 30 when the CLA population got to high for the amount of predators in the field (Figure 8). The Henry field was not sprayed with any insecticides and ECB was effectively controlled and CLA was controlled by predators until 2 weeks before harvest. The Agle field was sprayed four times with insecticides and only had slightly less insect damaged ears and slightly more marketable ears than the Henry field (Table 2). For both fields the number of ears damaged by ECB was zero or insignificant.

The wasp release field at the Werner farm started out with a pre-silk ECB percentage on July 8 (Figure 9) that was higher than the economic threshold of 15% which indicates that the ECB infestation was present before the wasps were released. The field was sprayed with SpinTor on July 16 and ECB levels were lower but still over threshold for silking corn so another SpinTor spray was applied. On July 22, one ECB parasitized egg mass was found which indicated the

wasps were still present in the field. There was a moderate pheromone trap count for ECB in Rush on July 29 (Figure 10) which corresponds with a higher ECB level on Aug. 4. Unlike the other fields examined CLA levels dropped in this field. The Werner wasp released field produced a very low amount of insect damaged ears and a high amount of marketable ears (Table 2). Only about one ear in 20 was damaged by either ECB or CLA.

In Lockport, the Coulter Farm site was sprayed once with SpinTor to reduce the amount of ECB, at a total insecticide cost of \$23.66/acre (Table 1). The Freatman Farm site was sprayed twice with Warrior and once with Asana to control ECB at a total insecticide cost of \$24.90/acre. In Kendall, the Partyka farm wasp field was sprayed three times with SpinTor to reduce the amount of ECB at a total insecticide cost of \$70.98/acre and the chemical control field was sprayed three times with Lannate at a total insecticide cost of \$27.00/acre. In Eden, the Henry Farm site was not sprayed at all and the Agle Farm site was sprayed twice with Warrior and twice with Lannate to control both ECB and CLA at a total insecticide cost of \$35.50/acre. In Rush, the Werner Farm wasp field was sprayed twice with SpinTor to reduce the amount of ECB, at a total insecticide cost of \$47.32/acre. Just based on EIQ field use ratings for the insecticides used at each farm site the wasp fields had a lower EIQ. The Henry Farm site had an EIQ = 0, Coulter Farm site had an EIQ = 1.2, Werner Farm site had an EIQ = 2.4, Partyka Farm site wasp field had an EIQ = 3.6, Freatman Farm site had an EIQ = 4.3, Agle Farm site had an EIQ = 23.8 and the Partyka Farm site chemical control field had an EIQ = 33. The low EIQ for the wasp treated fields was a function of a reduction in the number of sprays and the exclusive use of SpinTor to reduce ECB while preserving the parasite and predator populations in the fields.

In each of the wasp released fields *Trichogramma* had an effect on ECB infestation and if the wasps were released at the eight leaf stage insecticides may not have been needed for any of the wasp release fields. In all cases except one the amount of marketable ears harvested from the wasp treated fields was equal or higher than the chemical control treated fields. The reduction in the amount of marketable ears in the one wasp released field was due to the high infestation of CLA. The use of *Trichogramma* as a biological control of ECB on plastic fresh market sweet corn and early bare-ground sweet corn has the potential to be quite effective but it needs to be further field tested during years when ECB pressure is high and wasps are released into the field when the corn is younger than 2 weeks before tassel emergence. During years when ECB pressure is low *Trichogramma* releases have the potential to be a more economical and environmental way to produce fresh market sweet corn. Continued use of *Trichogramma* may also over time cause natural predator populations to increase to the point that CLA can be naturally controlled in fields that are not sprayed with insecticides. Information from this report will be passed on to growers and consultants to try and generate interest in trying to biologically control early infestations of ECB with *Trichogramma* inoculative releases.

References:

Reiners, S., C. H. Petzoldt and M. P. Hoffman (2001) Integrated Crop and Pest Management guidelines for Commercial Vegetable Production and the web site <http://www.nysaes.cornell.edu/recommends/>, Cornell Cooperative Extension Publication.

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ECB Scouting Reports for Coulter and Freatman Farms Coulter Wasp Release and Freatman Chemical Control

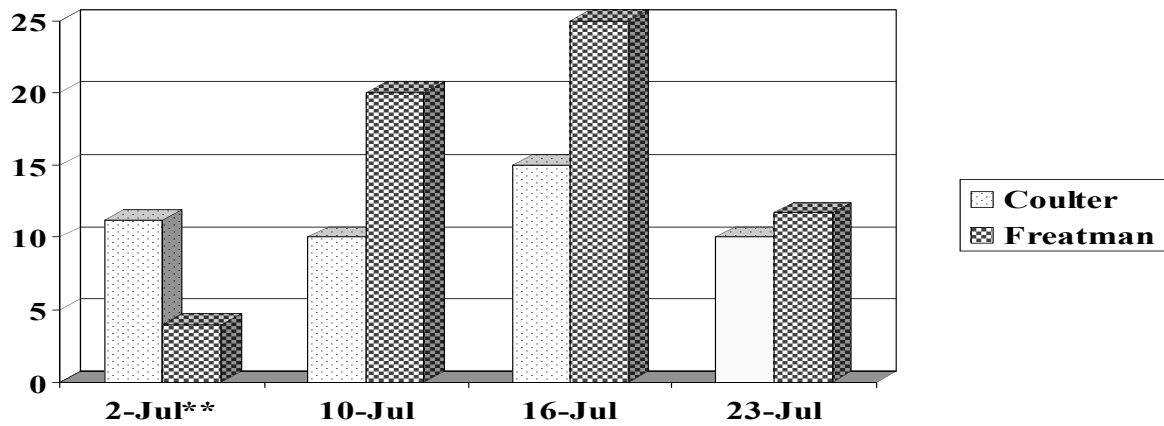


Figure 1. Percent European corn borer (ECB) damage and/or worms or eggs when the Coulter Farm wasp release field and the Freatman Farm chemical control field were scouted for ECB on different dates. **Three parasitized ECB egg masses were found when the Coulter wasp release field was scouted on July 2.

ECB and CEW Pheromone Trap Counts Lockport, NY

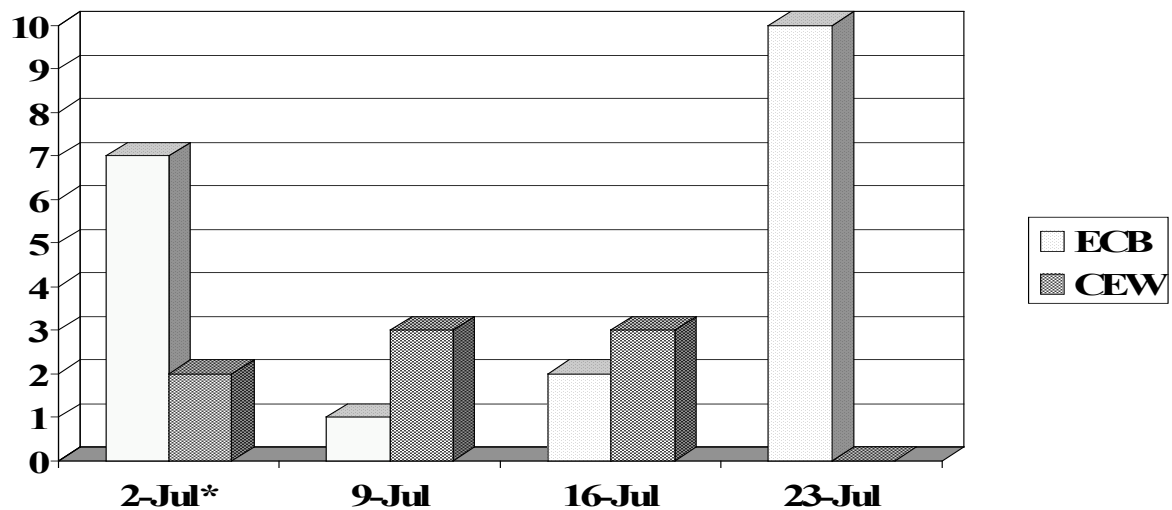


Figure 2. Number of European corn borer (ECB) and Corn earworm (CEW) moths caught in pheromone traps on different dates in Lockport, NY.

ECB and CLA Scouting Reports for Partyka Farms Partyka Wasp Release Farm

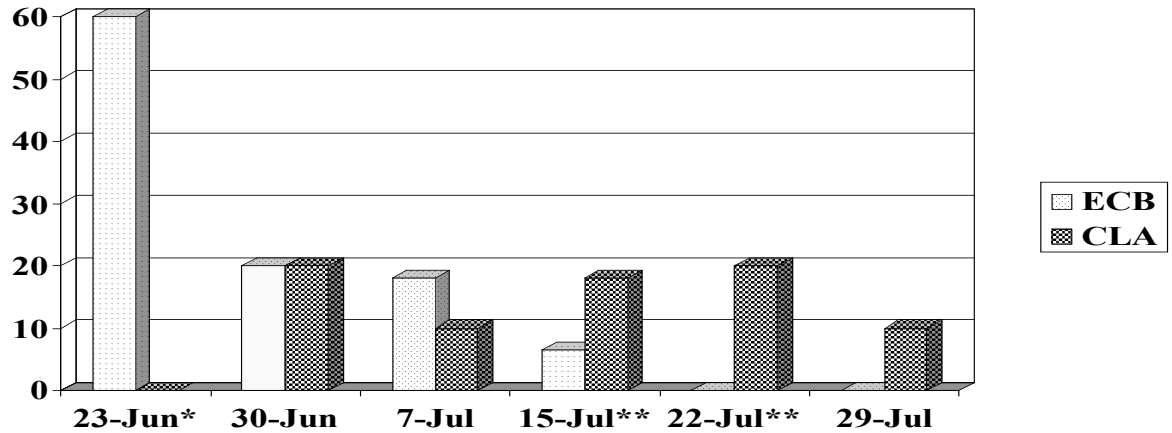


Figure 3. Percent European corn borer (ECB) damage and/or worms or eggs and percent corn plants or ears infested with Corn leaf aphids (CLA) when the Partyka Farm wasp release field was scouted for ECB and CLA on different dates. **One parasitized ECB egg mass was found when the field was scouted on July 15 and 22.

ECB and CEW Pheromone Trap Counts Hamlin, NY

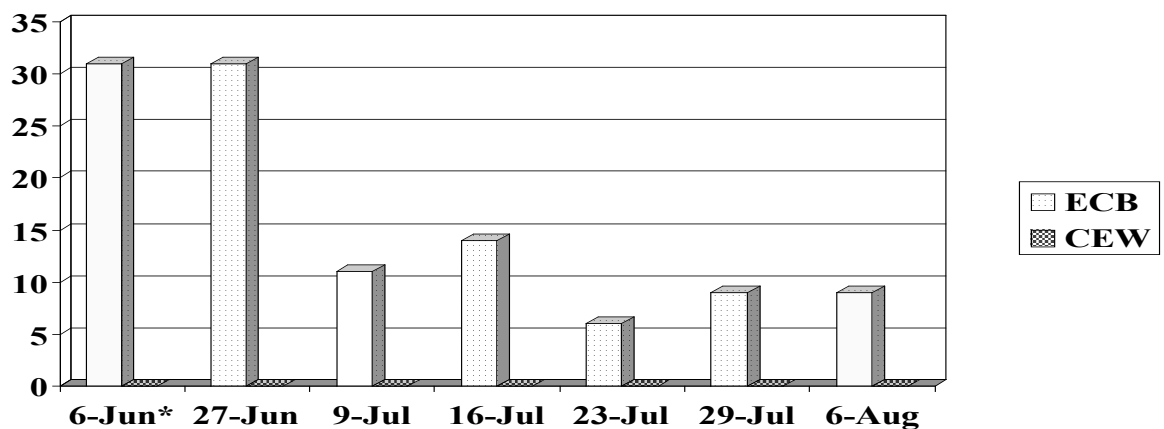


Figure 4. Number of European corn borer (ECB) and Corn earworm (CEW) moths caught in pheromone traps on different dates in Hamlin, NY.

ECB and CLA Scouting Reports for Partyka Farms Partyka Chemical Control Farm

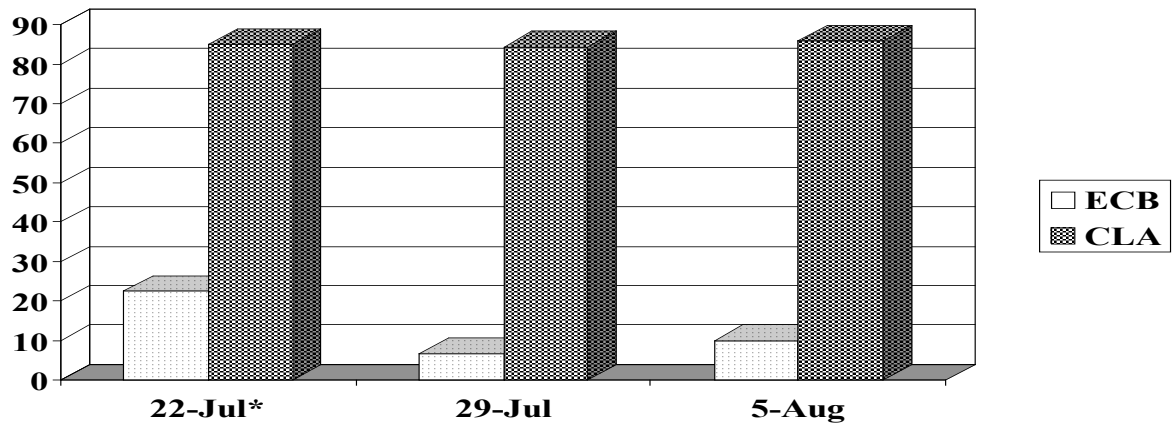


Figure 5. Percent European corn borer (ECB) damage and/or worms or eggs and percent corn plants or ears infested with Corn leaf aphids (CLA) when the Partyka Farm chemical control field was scouted for ECB and CLA on different dates.

ECB Scouting Reports for Henry and Agle Farms Henry Wasp Release and Agle Chemical Control

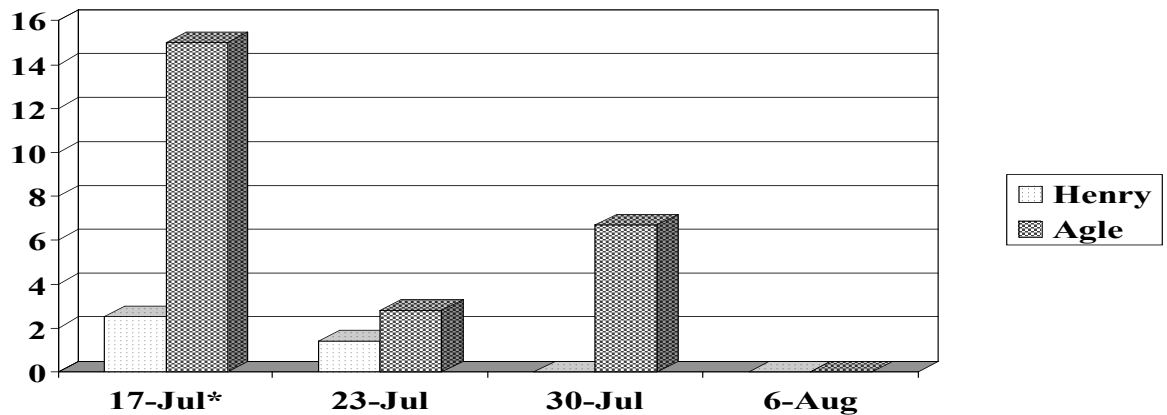


Figure 6. Percent European corn borer (ECB) damage and/or worms or eggs when the Henry Farm wasp release field and the Agle Farm chemical control field were scouted for ECB on different dates.

ECB and CEW Pheromone Trap Counts Eden, NY

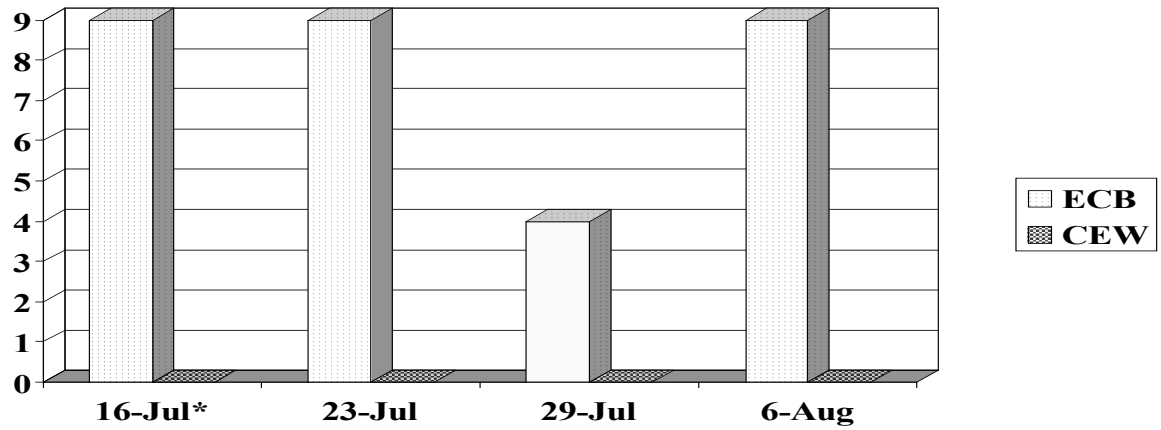


Figure 7. Number of European corn borer (ECB) and Corn earworm (CEW) moths catch in pheromone traps on different dates in Eden, NY.

CLA Scouting Reports for Henry and Agle Farms Henry Wasp Release and Agle Chemical Control

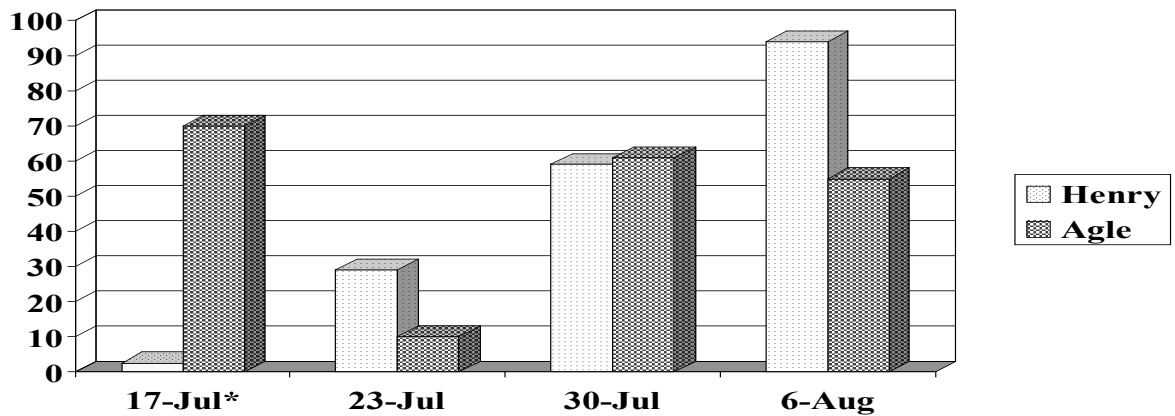


Figure 8. Percent corn plants or ears infested with Corn leaf aphids (CLA) when the Henry Farm wasp release field and the Agle Farm chemical control field were scouted for CLA on different dates.

ECB and CLA Scouting Reports for Werner Farms Werner Wasp Release Farm

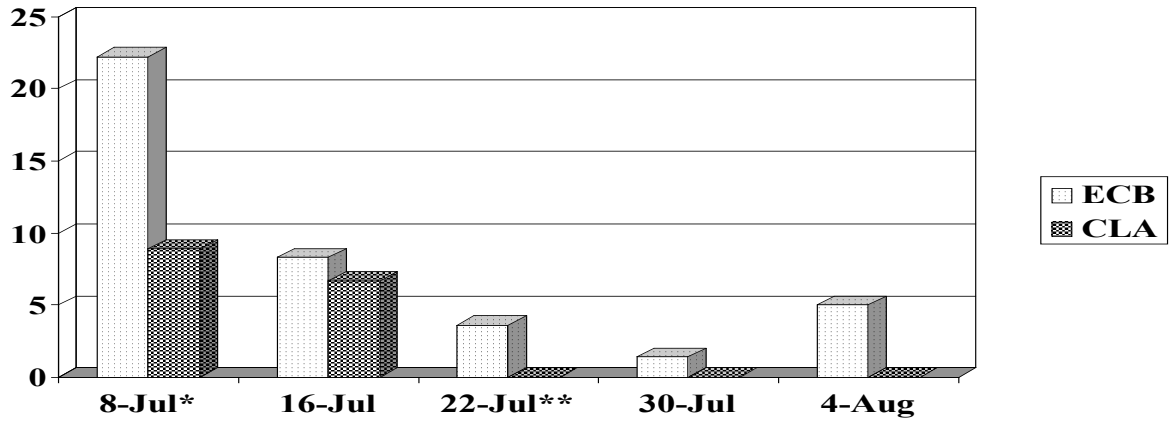


Figure 9. Percent European corn borer (ECB) damage and/or worms or eggs and percent corn plants or ears infested with Corn leaf aphids (CLA) when the Werner Farm wasp release field was scouted for ECB on different dates. **One parasitized ECB egg mass was found when the field was scouted on July 22.

ECB and CEW Pheromone Trap Counts Rush, NY

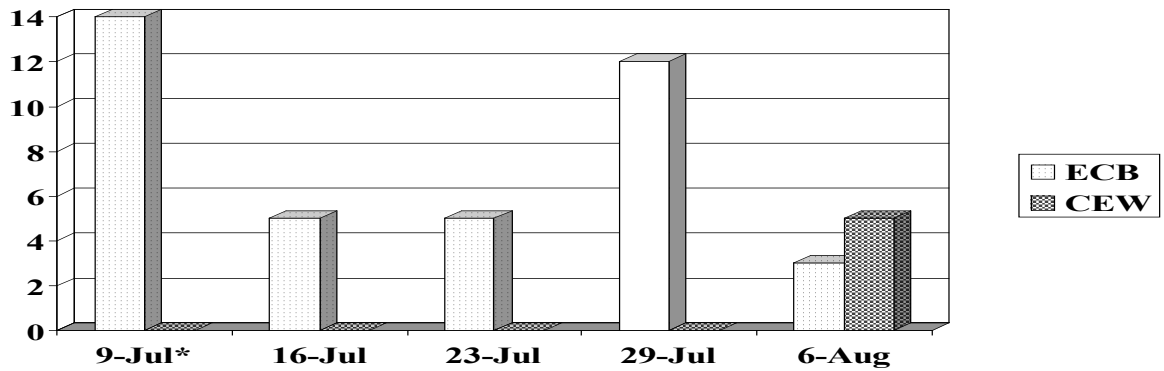


Figure 10. Number of European corn borer (ECB) and Corn earworm (CEW) moths caught in pheromone traps on different dates in Rush, NY.

Table 1. Grower costs for insecticides used in this project to control European Corn Borer (ECB) and/or Corn Leaf Aphid (CLA) and the field use Environmental Impact Quotient (EIQ) for each insecticide.

Common Name	Trade Name	Cost/gal	Average Applied/Acre	Average Cost/Acre	Field Use EIQ
Spinosad	SpinTor 2SC	\$673.00	4.5 fl oz	\$23.66	1.2
Lambda-Cyhalothrin	Warrior T	\$350.00	3.2 fl oz	\$8.75	<1
Esfenvalerate	Asana XL	\$123.00	7.7 fl oz	\$7.40	2.5
Methomyl	Lannate LV	\$64.00	18 fl.oz	\$9.00	11